

Release notes for ENDF/B Development n-044_Ru_104
evaluation

ENDF
B-VII.dev

April 26, 2017

- checkr Warnings:

1. A previous error halted parsing of the current section
MAT=4449, MF= 1, MT=451 (1): Parsing stopped

```
ERROR(S) FOUND IN MAT=4449, MF= 1, MT=451
SECTION CANNOT BE CHECKED FROM SEQUENCE NUMBER 147 TO 187
```

- checkr Errors:

1. A variable is outside the allowed ENDF range
MAT=4449, MF= 1, MT=451 (0): Variable range

```
ERROR(S) FOUND IN MAT=4449, MF= 1, MT=451
MOD = 1 OUT OF RANGE 0 - 0 RECORD NUMBER 147
```

2. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 2, MT=151 (0): Directory (b)

```
ERROR(S) FOUND IN MAT=4449, MF= 2, MT=151
SECTION 2/151 NOT IN DIRECTORY RECORD NUMBER 189
```

3. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 1 (0): Directory (b)

```
ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 1
SECTION 3/ 1 NOT IN DIRECTORY RECORD NUMBER 376
```

4. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 2 (0): Directory (b)

```
ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 2
SECTION 3/ 2 NOT IN DIRECTORY RECORD NUMBER 427
```

5. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 4 (0): Directory (b)

```
ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 4
SECTION 3/ 4 NOT IN DIRECTORY RECORD NUMBER 478
```

6. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 16 (0): Directory (b)

```
ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 16
SECTION 3/ 16 NOT IN DIRECTORY RECORD NUMBER 512
```

7. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 17 (0): Directory (b)

- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 17 | RECORD NUMBER | 529 |
| SECTION 3/ 17 NOT IN DIRECTORY | | |
8. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 22 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 22 | RECORD NUMBER | 540 |
| SECTION 3/ 22 NOT IN DIRECTORY | | |
9. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 28 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 28 | RECORD NUMBER | 557 |
| SECTION 3/ 28 NOT IN DIRECTORY | | |
10. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 51 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 51 | RECORD NUMBER | 571 |
| SECTION 3/ 51 NOT IN DIRECTORY | | |
11. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 52 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 52 | RECORD NUMBER | 605 |
| SECTION 3/ 52 NOT IN DIRECTORY | | |
12. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 53 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 53 | RECORD NUMBER | 637 |
| SECTION 3/ 53 NOT IN DIRECTORY | | |
13. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 54 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 54 | RECORD NUMBER | 668 |
| SECTION 3/ 54 NOT IN DIRECTORY | | |
14. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 55 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 55 | RECORD NUMBER | 699 |
| SECTION 3/ 55 NOT IN DIRECTORY | | |
15. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 3, MT= 91 (0): Directory (b)

- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT= 91 | RECORD NUMBER | 730 |
| SECTION 3/ 91 NOT IN DIRECTORY | | |
16. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 3, MT=102 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT=102 | RECORD NUMBER | 760 |
| SECTION 3/102 NOT IN DIRECTORY | | |
17. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 3, MT=103 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT=103 | RECORD NUMBER | 787 |
| SECTION 3/103 NOT IN DIRECTORY | | |
18. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 3, MT=104 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT=104 | RECORD NUMBER | 809 |
| SECTION 3/104 NOT IN DIRECTORY | | |
19. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 3, MT=105 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT=105 | RECORD NUMBER | 825 |
| SECTION 3/105 NOT IN DIRECTORY | | |
20. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 3, MT=107 (0): Directory (b)
- | | | |
|---|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 3, MT=107 | RECORD NUMBER | 838 |
| SECTION 3/107 NOT IN DIRECTORY | | |
21. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 4, MT= 2 (0): Directory (b)
- | | | |
|--|---------------|-----|
| ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 2 | RECORD NUMBER | 862 |
| SECTION 4/ 2 NOT IN DIRECTORY | | |
22. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 4, MT= 16 (0): Directory (b)
- | | | |
|---|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 16 | RECORD NUMBER | 1327 |
| SECTION 4/ 16 NOT IN DIRECTORY | | |
23. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 4, MT= 17 (0): Directory (b)

- | | | |
|--|---|--------------------|
| | ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 17 | |
| | SECTION 4/ 17 NOT IN DIRECTORY | RECORD NUMBER 1380 |
24. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 4, MT= 22 (0): Directory (b)
- | | | |
|--|---|--------------------|
| | ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 22 | |
| | SECTION 4/ 22 NOT IN DIRECTORY | RECORD NUMBER 1407 |
25. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 4, MT= 28 (0): Directory (b)
- | | | |
|--|---|--------------------|
| | ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 28 | |
| | SECTION 4/ 28 NOT IN DIRECTORY | RECORD NUMBER 1452 |
26. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 4, MT= 51 (0): Directory (b)
- | | | |
|--|---|--------------------|
| | ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 51 | |
| | SECTION 4/ 51 NOT IN DIRECTORY | RECORD NUMBER 1489 |
27. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 4, MT= 52 (0): Directory (b)
- | | | |
|--|---|--------------------|
| | ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 52 | |
| | SECTION 4/ 52 NOT IN DIRECTORY | RECORD NUMBER 1698 |
28. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 4, MT= 53 (0): Directory (b)
- | | | |
|--|---|--------------------|
| | ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 53 | |
| | SECTION 4/ 53 NOT IN DIRECTORY | RECORD NUMBER 1883 |
29. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 4, MT= 54 (0): Directory (b)
- | | | |
|--|---|--------------------|
| | ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 54 | |
| | SECTION 4/ 54 NOT IN DIRECTORY | RECORD NUMBER 2080 |
30. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 4, MT= 55 (0): Directory (b)
- | | | |
|--|---|--------------------|
| | ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 55 | |
| | SECTION 4/ 55 NOT IN DIRECTORY | RECORD NUMBER 2163 |
31. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF= 4, MT= 91 (0): Directory (b)

- | | | |
|---|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF= 4, MT= 91 | RECORD NUMBER | 2360 |
| SECTION 4/ 91 NOT IN DIRECTORY | | |
32. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 5, MT= 16 (0): Directory (b)
- | | | |
|---|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF= 5, MT= 16 | RECORD NUMBER | 2444 |
| SECTION 5/ 16 NOT IN DIRECTORY | | |
33. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 5, MT= 17 (0): Directory (b)
- | | | |
|---|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF= 5, MT= 17 | RECORD NUMBER | 2684 |
| SECTION 5/ 17 NOT IN DIRECTORY | | |
34. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 5, MT= 22 (0): Directory (b)
- | | | |
|---|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF= 5, MT= 22 | RECORD NUMBER | 2794 |
| SECTION 5/ 22 NOT IN DIRECTORY | | |
35. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 5, MT= 28 (0): Directory (b)
- | | | |
|---|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF= 5, MT= 28 | RECORD NUMBER | 2987 |
| SECTION 5/ 28 NOT IN DIRECTORY | | |
36. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF= 5, MT= 91 (0): Directory (b)
- | | | |
|---|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF= 5, MT= 91 | RECORD NUMBER | 3140 |
| SECTION 5/ 91 NOT IN DIRECTORY | | |
37. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF=33, MT= 2 (0): Directory (b)
- | | | |
|--|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF=33, MT= 2 | RECORD NUMBER | 3498 |
| SECTION 33/ 2 NOT IN DIRECTORY | | |
38. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF=33, MT= 4 (0): Directory (b)
- | | | |
|--|---------------|------|
| ERROR(S) FOUND IN MAT=4449, MF=33, MT= 4 | RECORD NUMBER | 3588 |
| SECTION 33/ 4 NOT IN DIRECTORY | | |
39. Missing a section in directory so your directory is messed up. This error will break everything else
~~MAT=4449~~, MF=33, MT= 16 (0): Directory (b)

ERROR(S) FOUND IN MAT=4449, MF=33, MT= 16
SECTION 33/ 16 NOT IN DIRECTORY

RECORD NUMBER 3642

40. Missing a section in directory so your directory is messed up. This error will break everything else
MAT=4449, MF=33, MT=102 (0): Directory (b)

ERROR(S) FOUND IN MAT=4449, MF=33, MT=102
SECTION 33/102 NOT IN DIRECTORY

RECORD NUMBER 3652

• **psyche** Warnings:

1. Strength function in URR not in agreement with PSYCHE's expectations
FILE 2 / SECTION 151 / ISOTOPE MASS = 104. L = 0 / STRENGTH FUNCTION IS 1.32494E-04 / STRENGTH FUNCTION 1.32494E-04 / LIES OUTSIDE LIMITS 1.00000E-05 TO 1.00000E-04 (0): URR str. ftn.

```
FILE 2
SECTION 151
ISOTOPE MASS = 104. L = 0
STRENGTH FUNCTION IS 1.32494E-04
STRENGTH FUNCTION 1.32494E-04
... [1 more lines]
```

2. Strength function in URR not in agreement with PSYCHE's expectations
FILE 2 / SECTION 151 / ISOTOPE MASS = 104. L = 1 / STRENGTH FUNCTION IS 9.57885E-04 / STRENGTH FUNCTION 9.57885E-04 / LIES OUTSIDE LIMITS 1.00000E-04 TO 8.00000E-04 (0): URR str. ftn.

```
FILE 2
SECTION 151
ISOTOPE MASS = 104. L = 1
STRENGTH FUNCTION IS 9.57885E-04
STRENGTH FUNCTION 9.57885E-04
... [1 more lines]
```

• **groupie** Errors:

1. Very small elastic cross section found
0: Small elastic

Multi-Group and Multi-Band Parameters from ENDF/B Data (GROUPIE 2015-2)

```
-----
ENDF/B Input and Output Data Filenames
ENDFB.IN
ENDFB.OUT
... [97 more lines]
```

• **fudge-4.0** Warnings:

1. Missing a channel with a particular angular momenta combination
resonances / resolved / MultiLevelBreitWigner (Error # 0): missingResonanceChannel

```
WARNING: Missing a channel with angular momenta combination L = 0, J = 1.5 and S = 1.5 for "capture"
WARNING: Missing a channel with angular momenta combination L = 1, J = 0.5 and S = 1.5 for "capture"
WARNING: Missing a channel with angular momenta combination L = 1, J = 1.5 and S = 1.5 for "capture"
WARNING: Missing a channel with angular momenta combination L = 1, J = 2.5 and S = 1.5 for "capture"
```

2. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 0 ($n + Ru104$): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

3. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 0 ($n + Ru104$): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

4. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 1 ((z,n)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

5. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 2 ($n[multiplicity:'2'] + Ru103$): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

6. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 3 ($Ru105 + gamma$): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

7. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 3 ($Ru105 + gamma$): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

• fudge-4.0 Errors:

1. Calculated and tabulated Q values disagree.
reaction label 7: $n[multiplicity:'2'] + Ru103$ (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -11565236.6743927 eV vs -8.9039e6 eV!

2. Calculated and tabulated Q values disagree.
reaction label 8: $n[multiplicity:'3'] + Ru102$ (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -17797286.50579834 eV vs -1.5136e7 eV!

3. Calculated and tabulated Q values disagree.
reaction label 9: $n + H1 + Tc103$ (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -13444638.00086975 eV vs -1.0781e7 eV!

4. Calculated and tabulated Q values disagree.
reaction label 10: Ru105 + gamma (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: 3246275.492996216 eV vs 5.9101e6 eV!

5. Calculated and tabulated Q values disagree.
reaction label 11: n + He4 + Mo100 (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -6993303.125228882 eV vs -4.3316e6 eV!

6. Calculated and tabulated Q values disagree.
reaction label 12: H1 + Tc104-s (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -7484182.025772095 eV vs -4.8205e6 eV!

7. Calculated and tabulated Q values disagree.
reaction label 13: H2 + Tc103-s (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -11220071.89993286 eV vs -8.5564e6 eV!

8. Calculated and tabulated Q values disagree.
reaction label 14: H3 + Tc102-s (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -13065517.93035889 eV vs -1.0402e7 eV!

9. Calculated and tabulated Q values disagree.
reaction label 15: He4 + Mo101-s (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -1595061.560119629 eV vs 1130960. eV!

• njoy2012 Warnings:

1. With the advent of the ENDF-6 format, it is possible to make evaluations that fully describe all the products of a nuclear reaction. Some carry-over evaluations from earlier ENDF/B versions also have this capability, but many do not. This message is intended to goad evaluators to improve things!
group...compute self-shielded group-averaged cross-sections (0): GROUPR/conver (0)

---message from conver---cannot do complete particle production for mt= 16
only mf4/mf5 provided

2. With the advent of the ENDF-6 format, it is possible to make evaluations that fully describe all the products of a nuclear reaction. Some carry-over evaluations from earlier ENDF/B versions also have this capability, but many do not. This message is intended to goad evaluators to improve things!
group...compute self-shielded group-averaged cross-sections (1): GROUPR/conver (0)

---message from conver---cannot do complete particle production for mt= 17
only mf4/mf5 provided

3. With the advent of the ENDF-6 format, it is possible to make evaluations that fully describe all the products of a nuclear reaction. Some carry-over evaluations from earlier ENDF/B versions also have this capability, but many do not. This message is intended to goad evaluators to improve things!
group...compute self-shielded group-averaged cross-sections (2): GROUPR/conver (0)

---message from conver---cannot do complete particle production for mt= 22
only mf4/mf5 provided

4. With the advent of the ENDF-6 format, it is possible to make evaluations that fully describe all the products of a nuclear reaction. Some carry-over evaluations from earlier ENDF/B versions also have this capability, but many do not. This message is intended to goad evaluators to improve things!
grouppr...compute self-shielded group-averaged cross-sections (3): GROUPR/conver (0)

---message from conver---cannot do complete particle production for mt= 28
only mf4/mf5 provided

5. With the advent of the ENDF-6 format, it is possible to make evaluations that fully describe all the products of a nuclear reaction. Some carry-over evaluations from earlier ENDF/B versions also have this capability, but many do not. This message is intended to goad evaluators to improve things!
grouppr...compute self-shielded group-averaged cross-sections (4): GROUPR/conver (0)

---message from conver---cannot do complete particle production for mt= 91
only mf4/mf5 provided